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T. H. HOSKINS, M. D., Editor. }

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BIRDS, IN THEIR RELATION TO AGRICULTURE.

By Geo. H. Perkins, Ph. D., Professor of Zoology, Botany and Geology, in the University of Vermont. Read before the Vermont State Board of Agriculture, June, 1871.

That all may have as complete an understanding of the subject as may be, let us say a few words in regard to the zoölogical characters and positions of birds, not so much for the sake of bringing forward anything new, as to revive in the memory facts already known. Birds may be scientifically characterized as air-breathing, warm-blooded, oviparous vertebrates, fitted for aerial life. Probably no group, of equal rank, in the animal kingdom presents so great uniformity in its essential characters. Among all the hundreds of differing tribes of the feathered race we find no such strange and aberrant forms as we have among the mammals in the winged Bats or the finned Whales. It is true that all birds do not fly, but they do all possess wings of some sort, though they may use them only as fins, as do the Penguins, or aids in running, as do the Ostriches.

Intense activity characterizes all the functions of the body as well as great efficiency. Nowhere else do we find so complete a respiratory system, for, besides the purification of the blood in the lungs, the capillaries meet the air in sacs, which are distributed in various parts of the body. These are chiefly to make the body light but they also assist the lungs in their work. The bones are all very compact and firm; those of the neck move very freely, allowing motion in all directions, while those of the back, to which the wings and legs are attached are fastened together so closely as to be almost immovable. The one main purpose and aim in the plan of structure seems to be fitness for flight. The firm muscles, the quickly beating heart, the light, compactly built body, the energy of all the parts, unite in the accomplishment of this end, and so effectually do they fulfill their mission that the speed and power of flight in many birds are very great. The Hawks and their allies can fly from eighty to one hundred miles an hour, their swoop being much more rapid, and many of our smaller birds, as the swallows and warblers, fly almost or quite as rapidly, and not only is their flight so swift, but they can keep on the wing for hours, or even days, with little or no rest. The eyes of an animal moving so constantly and so rapidly must have a different structure from that of man or other animals that move more slowly, or it could not accomplish its purpose. Accordingly we find all the parts of a bird's eye freely movable, and controlled by muscles. The eye of the Hawk, which lies flattened and far sighted as the bird sails slowly along the upper air, as soon as any prey is descried far below it, has every muscle ready for action, and as the bird sweeps down with the speed of wind, not only do the wings perform their part, not only do the talons and beak prepare for action, but the eye is all the time being drawn out round and full, and when the earth is reached it is as keenly near sighted as it was far sighted an instant before, and if the bird chance to turn toward the sun the third eyelid, the silvery metitating membrane springs over the eye and shields it from harm.

But, however interesting the structure and action of the various parts of a bird's body, an extended consideration of them is foreign to our present purpose, and so we pass on to notice very briefly the relations of birds to other animals. In their mode of reproduction and in the structure of some parts of the body birds have some affinity with the reptiles, but in other respects there is a greater resemblance to the mammals. Between these two classes, though not in all respects strictly intermediate, the birds are placed. There is no necessity for giving in this place a detailed classification, and we will pass this part of the subject by simply stating that many naturalists arrange the birds in two groups, one embracing those that hatch the young in a weak condition and so are obliged to feed and care for them for some time, as is the case with the Robin and other of our common song birds; the other group embraces such birds as the Partridge and our common fowls, whose young are able as soon as hatched to run about and care to some extent for themselves.

Besides this general division, some more specific arrangement is adopted. That most used by naturalists comprises seven orders which will be taken up in turn, though little need be said of most of them as they are not of special interest to the agriculturist, and one order, that of the Cursores or runners, which is composed of birds such as the Ostrich and Cassowary, will be omitted entirely. At this time only those species which are found within the limits of Vermont will be noticed.

The first order to be considered, Raptores or Birds of Prey, has not very much importance from an agricultural point of view. It is true that the frontier settlers suffer not a little from the depredations of Eagles and Hawks, but in a thickly settled country such losses are not usually very large; still these larger birds are injurious just so far as these depredations extend. The Owls, especially the smaller ones, deserve more favor, as they destroy large numbers of rats, mice, moles and such animals, that do more or less damage to the crops. But more than this they devour a great many of the large night-flying moths, which come from, and in turn produce the large larvæ, as the potato-worm and tobacco-worm. The common Screech Owl is especially serviceable in this way.

The Scansores or Climbers are of far greater importance, as many of them are most useful. Indeed it may be asserted with truth that all of this order which are found in Vermont are friends of the farmer. In warmer countries the numerous tribes of Parrots and similar birds are many of them very mischievous, but our species are all insect eaters. We have only the Woodpeckers and Cuckoos. The Cuckoos are not of great importance as they are few in number. They eat a great many caterpillars and other insects and so are beneficial so far as they go. Few birds are of so great value to the farmer as the Woodpeckers. As Wilson most truly says, this whole group seems to have been formed for the protection of our fruit and forest trees from the ravages of vermin. Among the many groundless and wholly false ideas in regard to birds is one which attributes to these birds the habit of sucking the sap of trees and which therefore bestows upon them the name of Sapsuckers. The absurdity of such an idea does not seem to have prevented it from becoming prevalent in some places. Equally unfounded is the idea that these birds eat the wood of the trees they visit. Aside from the fact that they very rarely attack those trees which are rich in sweet sap, such as the maple, but, on the contrary spend nearly all their time on Apple-trees, Pines and other trees whose sap could hardly be regarded as inviting, they visit the trees most in September and other fall months, and not so much in the spring when the sap is most readily obtained. The whole structure of the bill and tongue is against any supposition that the birds eat sap or wood. One species is however an exception to these statements. This is the Yellow-bellied Woodpecker or Sap-sucker of the West. There is no doubt that the injury done by this bird has been greatly exaggerated, but yet it seems doubtful whether it is wholly beneficial, and it probably does eat some of the inner bark of trees while searching for insects. Its tongue is smooth and it differs in other respects from the true Woodpecker, but yet an examination of the stomachs of quite a number of these species has shown that their chief diet is probably insects. It seems probable that, notwithstanding the great outcry that has been raised against them in some sections of the country, this Yellow-bellied Woodpecker will yet be acknowledged as a very useful bird. But, setting aside this doubtful species, there remain six or seven other species, in regard to which there is no doubt, and which, instead of injuring the trees they visit, most certainly benefit them.

As every fruit grower knows well his worst enemies are often the various borers. The borer is so hidden while at work that man finds it almost impossible to prevent its ravages and very difficult to even check them, but the Woodpecker finds just where the grub is located and with its sharp chisel-like bill easily digs into the wood and, when the worm is reached the barbed tongue transfixes and draws it out. So deftly is the work done that a very small amount of wood is cut away and no injury done the tree. It is the uniform testimony of observers that those trees which have been oftenest pierced are most thrifty. In more than fifty apple orchards examined by Wilson the best trees without exception were those that had received frequent attacks from the Woodpecker. Many of the trees "were over sixty years old, their trunks covered with holes, while the branches were broad, luxuriant and loaded with fruit." "Of decayed trees more than three-fourths were untouched by the Woodpeckers."

Probably the most useful of our Vermont species is that called the Downy Woodpecker (*Picus pubescens, Linn.*) a black and white bird, usually not over six inches long, and another called Hairy Woodpecker (*Picus villosus, Linn.*) which is very similar in appearance, though larger. These birds are quite common about orchards and should be encouraged to stay. Some of the larger species, at certain seasons, eat corn and a little fruit, but the amount they take is too small to be made any account of. The Red-headed Woodpecker is more destructive to fruit than any of the others. It eats apples, pears and such fruit, always selecting the ripest and best and it is said, besides this, to eat some corn, especially when it is in the milk. Notwithstanding all this their proper food is insects, and there can be little doubt that they do far less to destroy, than to save fruit, for what they eat is only a small part of that they have saved from destruction by destroying thousands of insects.

Leaving this not very large but useful group, let us pass on to the consideration of a very large and important order, that of the Insessores or Perching-Birds. The species of this group are very numerous and the individuals, are numbered by the thousands, and a very large number are of special interest to the agriculturist. In entering upon this part of our subject we are treading upon ground, every inch of which has been hotly contested and even now the discussion in regard to some species has by no means ceased.

Although there is a pretty general agreement among naturalists in regard to most of our birds, those who have not made a special study of their habits and structure are by no means so nearly unanimous in their opinion. Because the ground to be passed over is contested, all theoretical views and all that is simply probable will be omitted, and only what is believed to be a fact well established and capable of proof will be presented. For this reason a careful consideration of what may be offered is desired.

Of course in so limited a space as is now at my command, I can speak of only a few of the most important species, and must leave unmentioned many others, of less interest perhaps, but yet not wholly unworthy of regard, such sa the Humming Bird, Vireos, Warblers, Finches, &c. The Whippoorwills and Night Hawks, are harmless, and very beneficial as they destroy, in common with the Owls, many of the nocturnal insects. The little Wrens are of considerable service in devouring the eggs and small larvæ of insects, many of which are too minute to be seen by man and yet they may develope into formidable enemies. Still more useful in the same way is the common Titmouse, a bird regarded by many as very troublesome, and with some show of reason, for he may be seen not rarely tearing the buds from plants and after pulling them to pieces throwing them away. This certainly looks very much like mischief, but if any one will take the trouble to examine these castaway buds, every one will be found with the marks of a worm within it, and this is the object which the bird seeks, and so, while apparently doing harm, it is really preventing a much greater evil. Not only in this way does the Titmouse prove serviceable, but in many others.

The Chickadee or Black-capped Titmouse is one of our winter birds, and after the leaves have dropped from the trees and bushes he may be seen carefully examining the bark and thrusting his sharp little bill into every crevice, often spending a long time upon a single branch, and thousands of eggs left during the summer by the canker-worm, apple-worm and hosts of similar pests are thus prevented from doing harm, nor does it cease its labors in summer when the eggs of insects are not so plenty, but it still wages unceasing warfare against the enemies of the farmer. Mr. Samuels in his exceedingly valuable work on the "Birds of New England" states that it has been calculated that a single pair of these Chickadees destroys five hundred grubs and caterpillars daily.

Probably no bird has been the subject of more dispute, or the object of as many false opinions, as our common Robin, and yet no bird is more familiarly known and none should be better understood. It is not very wonderful that when one sees his pet cherry-tree, as it is just ripening its fruit, visited from morning till evening by hungry Robins, he should set down the birds as fit only for powder, and it is undoubtedly trying to one's feelings to have the strawberry bed plundered, and the raspberries and grapes, the ripening of which has been tenderly watched, missing when the expectant owner goes to gather them. We are all very sensitive when anything affects our palates or our pockets. After all this allowance I yet hope to show that the Robin is a most beneficial and useful bird. The cherries and strawberries show us only one very small side of the question.

Let us consider a few facts which show what the Robin really is and what he does; some of these are from my own observation